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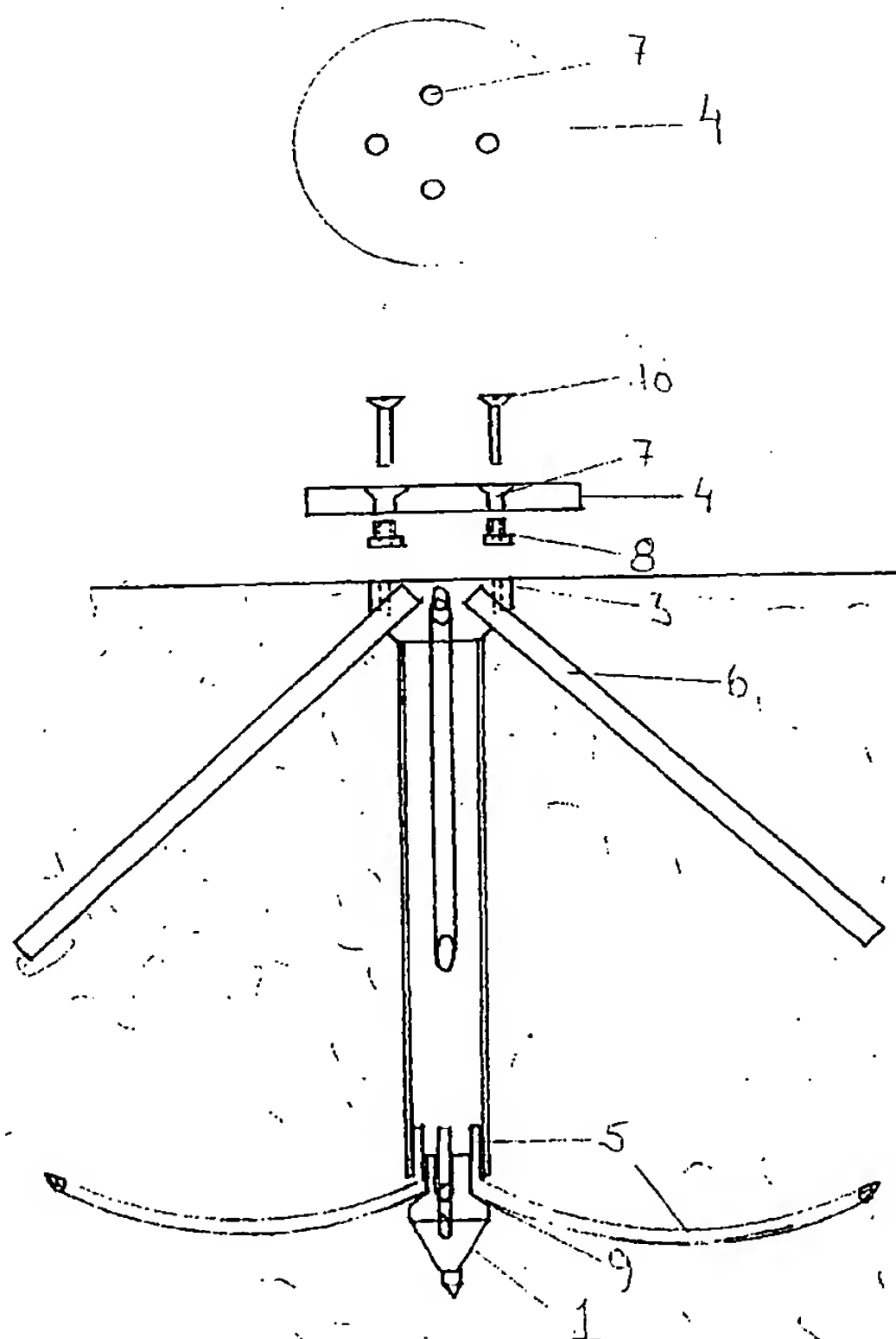
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Declarations under Rule 4.17:

— as to the identity of the inventor (Rule 4.17(i)) for all designations

[Continued on next page]

(54) Title: **ADJUSTABLE FOUNDATION ANCHOR**



(57) Abstract: The product in question is an adjustable earth-anchor that can be driven down into the ground without the process of digging. Integrated arms can be forced out of the mechanism deep into the ground and afterwards the head and adaptor unit provide a platform ready to accommodate end-products like outdoor equipment, sheds etc. Adjustments and necessary horizontal or vertical fine tuning can be undertaken at the level of the head and adaptor unit. The adjustable earth-anchor also gives the possibility to respond promptly to foundation with high accuracy and location adjustments on various products such as sheds, shelters etc. The concern earth-anchor provides various anchoring systems at the top and bottom of the device. These can be driven out deep into the ground separately and not depending on each other. The two integrated top and bottom arms mechanism of the earth-anchor ensures good stability and existence against lifting, pushing, and lateral forces. The invention also provide that advantage that the arms, whether they are the top sets or the bottom sets, do not require the process and hassle of digging or major preparation in order to be driven out deep into the ground. Furthermore the earth-anchor now gives the possibility to make adjustments in various possible directions by regulating the adaptor to give easy access to accommodate end-products such as sheds, signs, road products. The level of precision and accuracy is highly rated and as good as the concrete-based foundation.

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- of inventorship (Rule 4.17(iv)) for US only

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Adjustable Foundation Anchor

The invention concerns the adjustable foundation Anchor described in the initiating part of claim 1, which in a simple way without any digging can be driven into- and under terrain, thout and with the use of machinery tools.

The upper part of the Anchor, the head with adapter is constructed and designed with the ability of mounting different kinds of products such as urban equipment, signs, roadproducts, coverings, sheds, fences etc.

By the fact that the foundation-arms are driven through the centre of the anchor head and out under the coating, costly damaging of the coating is avoided.

The traditional way to found products such as urban equipment, signs, road-products, coverings, sheds and fences etc. is by the use of concrete foundation. In this situation the typical way of working is to dig an appropriate hole followed by the placement and the supporting of the product in the desired position. After this the hole is filled with concrete and left to harden. After typically 48 hours the supporting of the product can be removed and the coating can be reconstructed.

The traditional point-foundation with the use of concrete is very time demanding because of the necessary time for hardening of the concrete, and in addition to this the necessary removing of the coating, digging followed by costly reconstruction of the coating.

All this means that this form of point-foundation is far more expensive and time demanding compared with the use of a foundation anchor, as the applied adjustable foundation anchor.

In addition to this there is normally not any kind of built-in breaking-joint with the use of above mentioned concrete foundation. Therefore it is necessary to make a costly digging of the concrete foundation with following reconstruction of coating if damaged products have to be replaced.

With the use of the applied adjustable foundation anchor it is possible to remount and replace damaged products without costly digging and reconstruction of the coating, because the adapter or the product is mounted on the top of anchor with integrated breaking-joint.

Another option on how to lay and tackle end-products such as outdoor equipment, signs, road products, shelters, sheds, fences or balustrades is the use of earth anchors as the patented US 952,404. A major advantage of such earth anchor is that both anchor and end-product can be installed simultaneously without waiting for concrete to be set efficiently. However the use of such particular earth anchor as the patented US 952,404 involves cost-effective digging and resurfacing. The fact that the top-arms require that the anchor-body and device (see *fig.6 US patent 952,404*) must be inserted freely down in the ground before being driven out implies quite some digging over a large and deep surface.

Patented US's earth anchor 952,404 consists of an anchor-body (*see fig.1, no.1 in US patent 952,404*) through which two bottom-arms (*no.20&21*) are driven out as illustrated in *fig.1*. In addition to this, there is a device (*fig.6*) which is mounted round the upper part of the anchor-body and through which the two top-arms (*No.52&54*) are driven out through the controller guides (*No.36&38*).

Another device (*fig.8*) is mounted on top of the anchor-body and where for instance the end-product can be fixed and adjusted accordingly. That particular device consists of two complex pipes (*No. 60&64*) which are bolted on the anchor-body. The horizontal and oblique arms (*No.66* and *No.100*) can be adjusted in order to give the mast (*No.70*) a vertical positioning. US earth-anchor patented 952,404 is vulnerable to damages in case the mast is ran-over due to the inexistence of a breaking-point on the devices on top of the anchor-body above the ground.

The arms (both top and bottom) abilities that they can be driven out separately and independently to each other is a major benefit compared to the more collective types where the arms are driven-off simultaneously. In such particular design, one single obstructed arm will prevent the other arms from driving out.

The patented earth anchor US 952,404 is installed by driving the anchor-body (*No.1*) into the ground to the required depth and the bottom-arms (*No.20&21*) forced out deep inside the ground. The device (*fig.6*) is mounted round the anchor-body and it is absolutely necessary that

the ground surface is broken through and a large and deep enough hole is dug so that the top-arms can be pushed freely through the controller guides (No.36 &38 in fig.6)

The implication of digging and resurfacing with the use of the patented US 952,404 earth-anchor makes the project quite costly and on the whole it becomes even more costly than the more traditional method based on concrete foundation.

The device as shown in Fig.6 which controls and guides the top-arms is mounted on the anchor-body and can be adjusted to the required depth and position. Subsequently can the top-arms be driven out in opposite directions. Even though when the top-arms are driven fully out, a slight benefit can be obtained against the vertical push-pull actions perpendicular to the top-arms. On the other hand, a parallel push-pull action in the direction of the arms will result in extremely low stability as only one of the arms will be deeply rooted while the other one will be driven back to its own track.

In addition, it is likely that the ground around the top-arms can cause a major set-back. An obstruction on the way of the arm can cause it to bend and curve slightly resulting in the arm losing its original track and move out of the guide (No.36). Consequently the anchor will loose stability and be dependent on only the controller guide (No.38) to provide stability. Likewise, the top-arms can be driven out of position if subjected to rotational forces or actions.

Installing and mounting products such as outdoor equipment, signs, road products,shelters, sheds, fences etc. demand a certain level of precision and accuracy. The patented earth anchor US 952,404 provides a certain degree of adjustments via devices (fig. 8,9,10&11) mounted on top of the anchor-body. The two pipes (No.60&64) in fig. 8 are used as a platform on which item No.66 is used to adjust and secure item No.100 which in turn is fixed to item No.70. Subsequently the vertical angle can be adjusted and regulated appropriately.

However the foundation methods and technics are not quite practical with respect to end-products like outdoor equipment, fences, shelters etc. due to the amount of space the device occupies and its bulky physical structure.

Consequently it is economically more demanding to mount and adjust such devices in contrast to the more manoeuvrable and simple design like the adjustable earth-anchor seeking patent.

The adjustable earth-anchor as described in this patent application can be inserted into the ground without any digging followed by driving out all the arms which are independent to each other. The whole process is carried out without breaking down the ground surface. On the other hand both the adaptor and product can be vertically or horizontally adjusted simultaneously. Likewise the adjustable bolts and nipples do not require a surface area larger than the head of the anchor in breadth and the whole system appear to be like an integrated part of the end-product which sits over the earth-anchor.

At the same time the foundation for an end-product of any kind (outdoor equipment, shelters, sheds, signs, road products, fences etc.) will involve lesser surface break through or damages and resulting in a lower project costing as resurfacing reveals to be unnecessary.

As with the case of concrete laid foundations for the abovementioned end-products, the earth-anchor can provide as good accuracy and precision with the help of the adjustable head of the anchor.

Regarding the economical factors and the time-efficinencies of laying foundations, the use of earth-anchors must to a full extent be more beneficial than its counterpart traditional concrete laid foundations.

The use of the patented earth-anchor US 952,404 requires consequent digging in order to insert the top-arms through the control guides No. 36 & 38 and at the same time the total cost increases considerably not only because of extensive digging but also to the fact that resurfacing must be carried out afterwards. The constant digging and resurfacing process also brings to a limit the amount of time that can be saved during the whole process from start to finish. On top of that, the patented US 952,404 earth anchor own costing and the adjustable devices bring the whole product to a remarkable overall costing.

From a purely economical point of view, the utilization of the patented US 952,404 earth anchor and its adjustable devices to foundation solutions reveal to be more costly than the use of the traditional concrete-based foundations or the adjustable earth-anchor seeking patent.

The non-existence of a genuine breaking-point at the level of the adjustable devices in the patented US 952,404 implies that the whole anchor system is prone to damages in case of a collision or if being ran over. A consequent collision will result in a very likely deformation of the top of the anchor-body where item No.60 is mounted. Such damage to the anchor-body can make it practically impossible to re-mount another adjustable device on top and the plain solution will be to remove and install another earth-anchor.

The utilization of the adjustable earth-anchor seeking patent resolves a major application which Demand 1 characterizes that the adjustable earth-anchor head comprehends of slant controller guides (No.11) to accomodate and support the arm's (No.6) and holes (No.3) for mounting and adjusting the adaptor (No.4) or end-products (such as outdoor equipment, shelters, sheds, fences, balustrades, signs, road products etc.). That also give possibility to avoid or completely omit digging for foundations and afterwards resurfacing..

The introduction of a breaking-point between the head (No.3) and the adaptor (No.4) or the end-product (such as outdoor equipment etc) gives the adjustable earth-anchor a particular characteristic such that there is no necessity to go through the process of digging and resurfacing in case an end-product (such as sign, fence etc.) is being ran-over or subjected to hard impact. The breaking point ensures that the deep rooted earth-anchor suffers no damages in contrast to the traditional concrete-based foundation or the patented US 952,404 earth-anchor.

The adapter (No.4) with holes (No.7) under which are the adjustable nipples (No.8) gives the possibility to drive the adjustable earth-anchor down under surface and afterwards drive the arms through the manufactured controller guides (no.11 and 9) located at the top and at the bottom of the anchor. This process can be carried out without the use of any digging of the surface and therefore no need for any resurfacing. To finish off, it is well possible to fix or adjust a desired product on top of the head (No.3) and adaptor (No.4) shortly afterwards.

This particular earth-anchor system is adjustable and at the same time can be driven down the ground and the arms forced to spread out without the usual process of digging and resurfacing. The system can be very competitive in relation to the other earth-anchors or traditional concrete-based foundations.

This patent seeking anchoring system gives also possibility to drive down and forced out both the top and bottom arms and makes appropriate adjustments and preparations to accomodate and end-product in a very short time compared to other known technics. Consequently the time and economic efficiencies of this particular system can in fact raise the competitiveness in the foundation laying areas. The easy adaptability, mounting and quick adjustments give a different dimension and approach to known technics such as the one used by the patented earth-anchor US 952,404.

The constructiojn design of this partucial earth-anchor system ensures that both the top and bottom arms can be driven out seperately and independent of each other. As a matter of fact, optimum anchoring can only be obtained when the arms are independently driven out. This brings a major advantage in relation to the other earth-anchoring system where the arms are driven out collectively; where a single obstructed arm can disturb or hamper the remaining arms and resulting in a considerably poor founadation with little stability.

The constructuion design of this patent seeking anchoring system includes a breaking point at the head (No.3) and this is advantageous in case of a collision or an end-product being ran-over. The design characteristic enables an end-product to be changed or re-mounted without the need for any digging and eventually any resurfacing processes. At the same time, while the damages are recorded above the surface, the deep rooted earth-anchor remains intact and undamaged compared to other anchoring methods or the concrete-based foundations where the damages can be recoded further under the surface.

The mounting of end-products such as outdoor equipment, shelters, sheds, road products etc. stresses out a certain level of aestheticity. Based on this criteria, it is very likely that anchoring system such as the patented earth-anchor US 952,404 does not provide an adequate solution

due to its bulky and space demanding characteristics. A more realistic option can be the anchor system and its adjustment device such as the adjustable earth-anchor seeking patent.

Furthermore the adjustable device as described in patent US 952,404 is relatively more expensive than the adjustable device from the earth-anchor as described in the patent application. Here the earth anchor consists of only an adaptor with nipples and bolts.(fig.3)

The construction and design of the head with adjustable adaptor unit or end-product as described in the patent application provides a better outlook with the end-product such as outdoor equipment as it appear that the whole system is integrated as a single unit.

Unlike the earth-anchor as described in the patent application, it is not technically possible for the other systems such as the US patented 952,404 earth-anchor or the traditional concrete-based foundation to lay a foundation, fix and adjust an end-product (such as outdoor equipment, sheds, shelters, etc) without the process of digging, resurfacing or concrete casting. The aim of this particular invention is to provide a more flexible approach to easy foundation with the help of the anchor adjustable possibilities. This is rendered technically possible by means of well-designed head and adaptor with adjustable accessories such as bolts and nipples. It is also very convenient to lay one or several foundations onto specific points with a high degree of accuracy that until now is impossible.

In addition to that, the adjustable earth-anchor can be driven into the ground and the arms forced out without any pre-digging. In such way, additional contemporary expenses such as the time factor and resurfacing are avoided.

The anchor's arms are driven out independently and one at a time thus ensuring optimum stability as each and every arm can be forced out to its extreme point underground as opposed to the anchor system with collective arms where a single arm can virtually paralyse the remaining arms to standstill.

The adjustable earth-anchor as described in the patent application gives the possibility for quick and efficient repair work to be undertaken without major setbacks in case of damaged end-product. In extreme cases such as collisions or end-product being ran over, the bolt that secure

the adaptor to the product, will eventually break before any damage is caused to the buried anchor. (In general cost for replacement of damaged end-product is relatively high in the case of the concrete-based foundations)

The adjustable earth-anchor can basically have two sets of arms that can be driven out into the ground; a top set and a bottom set. The driven out top-arms (No.6) make the earth-anchor more resistant to downward and lateral external forces while the bottom driven-out arms ensure more stability against major upward forces or lift.

The earth-anchor in question has a very unique structure that gives the possibility to fine adjust the adaptor (No.4) in relation to the head (No.3). This can be actively done through the well-designed nipples with edged heads for good grip by up and down adjustments through the adaptor holes (No.7)

The description below gives a more detailed concept of the invention in question:

Fig.1 and 2 show a transverse sections of the adjustable earth-anchor used as a foundation for various end-products like outdoor equipment, signs etc.

Fig.3 shows the transverse section of the adjustable head and adaptor devices.

Fig.3a shows the transverse section of the adjustable head with the slanted control guides (No.11), through which the top-arms are inserted.

Fig.4 shows the transverse section of the bottom-end of the earth-anchor

Fig.5 and 6 shows the earth-anchor in question before and after insertion into the ground respectively.

The newly designed adjustable earth-anchor consists of one or more stable and very simple functional arms (No.5 and No.6) with the characteristic of being independent to each other while being driven out. The intelligent aspect of independent driving off of the arms means that less effort or force is required to force the arms out. Another aspect that is brought over is the lesser risk that the foundation can be diverted from its desirable position as big stones or other obstructions will not hamper the driving off of one or the several arms.

The arms (No.5 and No.6) at both extremities (top and bottom) can be driven out from the head piece No.3 one at a time even though when the earth-anchor is completely inserted in the ground as shown in Fig.3a where the slanted controller guides (No.11) are in the head piece (No.3) and in Fig.4 where the controller guides (No.9) are at the bottom end (No.1). Fig.3a also shows the adaptability of fixing and fine adjusting the adaptor (No.4) over the head piece (No.3) through the holes (No.12)

The adjustable earth-anchor can be inserted into the ground and the arms (No.5 and No.6) driven out without the need of any concrete casting or digging and any eventual resurfacing.

In addition as shown in fig.3 it is possible to level, fine-adjust and mount end-products such as sheds, shelters, fences, road products etc. by means of the nipples (No.8) which is mounted under the adaptor (No.4) and through turning (clockwise or anticlockwise), it is possible to adjust the adaptor in a vertical and horizontal motion and finally the bolts (No.10) ensure a secure platform by fixing the adaptor to the head piece (No.3) via the holes (No.12)

The unique design structure of the head (No.3) ensures that any damaged end-products can be easily replaced and re-mounted by the help of the bolts (No.10)

The bottom end (No.1) of the adjustable earth-anchor enables the bottom arms (No.5) to be driven out through the controller guides (No.9). The slant structure of the controller guides help the system to sustain a more stable structure as the arms will be driven out at an angle in respect to the anchor body (No.2)

The anchor arms (No.5 and No.6) can be driven out through both head and bottom-end unit or through either one of the unit. Moreover the arms, whether the top or bottom ones can be activated independently thus avoiding any malfunction as in the collective system where a single obstructed arm will result in paralyzing the other remaining arms.

The top arms (No.6) which is driven out from the head unit (No.3) through the controller guides (No.11) give the earth-anchor more strength against any downward or lateral forces applied onto the system and the bottom arms (No.5) when fully driven out from the bottom unit (No.1) can efficiently counter act any lifting forces exerted upon the anchor.

The head (No.3) and adaptor unit (No.4) of the earth-anchor is designed in such a complex way that it gives the possibility to make adjustments in every directions. The system also enables the laying of single or several foundations onto a specific points with a high degree of accuracy that can also be achieved by the traditional methods of concrete based foundations.

The introduction of a breaking point between the head (No.3) and the adaptor unit (No.4) in the earth anchor device brings a great advantage in situation when the above end-products sustain violent collisions or are being ran-over. Replacing an end-product can be undertaken without the process of digging and afterwards re-establishing the surface. The breaking point ensures that the deep rooted earth-anchor doesn't suffer any damages which in contrast is quasi-inexistent in the concrete-based foundations.

The physical structure of the bolts (No.10) which fix the adaptor unit (No.4) to the head (No.3) of the adjustable earth-anchor can be made weaker for earth-anchors rooted in areas where risks of impacts on end-products are frequent. The major advantage of such changes in the bolt structure is to avoid damages to the deep rooted anchor below the surface. In doing so, replacement of above ground end-product will only involve changing of the adaptor unit (No.4) while holding to the same earth-anchor rooted below the surface.

The adjustable earth-anchor also gives the possibility to drive the top and bottom arms directly into the earth-anchor body without any digging and making fine adjustments to the adaptor unit above the head efficiently and effectively. This can be done due to the fact that both the top and bottom arms can be driven out into the ground first through the centre of the head unit (No.3) and afterwards the controller guides (No.11 and No.9) help the top and bottom arms respectively out deep under the surface. The arms can be forced out independent of each other giving optimum stability to the earth-anchor unit. The head unit (No.3) of the earth-anchor has holes (No.12) and thus provides a good platform onto which the adaptor unit (No.4) can be fixed and if adjustments are necessary, this can be done by the adjusting the nipples (No.8) which sit in between the adaptor and the head unit.

The earth-anchor consists of two sets of arms; the top set and the bottom set. Each set of arm, whether top or bottom can have one or several arms. The bottom set of arms are first inserted

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into the earth-anchor main body (No.2) and forced down in a parallel motion to the main body (No.2). The controller guides (No.9) at the bottom end of the earth-anchor enable the arms to go through and the slanted structure of the holes enable the arms (No.5) to move outwards and bend to a hooked like form as shown in fig.6

The top set can also have one or several arms (No.6) and are driven out through the slant controller guides (No.11) to form a solid straight shape as shown in fig.6 to ensure stability against downward and sideward extreme forces.

The head and adaptor unit of the earth-anchor described in the patent application is cleverly designed in such a way to give the possibility to adjust end-products (like shelters, fences etc) in various directions. As shown in fig.3, the nipples (No.8) which sit in between the head (No.3) and the adaptor unit (No.4), can be regulated to adjust the adaptor unit in a vertical or horizontal motion. The bolts (No.10) are hence use to secure the unit to the head (No.3) through the holes (No.12)

In areas with sand or soft materials under ground surface, the application of concrete based foundation will result in an uneven surface after the concrete has set. This situation of an uneven surface around the foundation can be widely observed where concrete based foundation has been used. However such type of problem is non-existent when earth-anchored systems are used. Furthermore the expenses arising due to the processes of digging, concrete works, resurfacing and asphaltting are largely reduced or at the most completely reduced in the application of earth-anchor devices.

Patent demands.

1.

The adjustable earth-anchor comprehend of the head (No.3), the top and bottom arms (No. 6 and 5 respectively), and the anchor's main body (No.2) with a bottom-end (No.1). The bottom-end unit is designed with controller guides (No.9) to accomodate the bottom arms (No.5) which is initialle located inside the anchor's main body. The head of the adjustable earth-anchor characterises the inclusion of the slanted controller guides (No.11) to accomodate the top-arms (No.6) and the presence of holes (No.3) to support the adaptor (No.4) or end-products such as outdoor equipment, sheds, shekters, fences, road products, signs etc. The adaptor unit (No.4)

consists of holes (No.7) whereabouts nipples (No.8) are used to orient the adaptor unit in relation to the head of the earth-anchor.

2.

According to demand 1, the adjustable earth-anchor characterises the presence of single or more slanted controller guides (No.9) at the bottom end unit (No.1). The guides are to allow the driving through of the bottom arms (No.5) without the use of any digging.

3.

According to demand 1 or 2, the adjustable earth-anchor characterises the presence of single or more slanted controller guides (No.11) located around the head (No.3) and through which the top arms (No.6) can be driven out without the use of digging.

4.

According to demand 1, 2 or 3, the the design of the head characterises the possibility of adjustments and accurate location of the adaptor unit and end-products such as outdoor equipment, sheds, shelters, fences, signs etc.

5.

According to demand 1, 2, 3 or 4, the design of the head with a breaking point characterises that the earth-anchor rooted below the surface suffers minimal damages and at the same time assure simple and easy replacement and mounting of end-products such as outdoor equipment, sheds, shelters, signs, road products, fences etc.

Summary

The product in question is an adjustable earth-anchor that can be driven down into the ground without the process of digging. Integrated arms can be forced out of the mechanism deep into the ground and afterwards the the head and adaptor unit provide a platform ready to accomodate end-products like outdoor equipment, sheds etc. Adjustments and necessary horizontal or vertical fine tuning can be undertaken at the level of the head and adaptor unit.

The adjustable earth-anchor also gives the possibility to respond promptly to foundation with high accuracy and location adjustments od various products such as sheds, shelters etc.

The concern earth-anchor provides various anchoring systems at the top and bottom of the device. These can be driven out deep into the ground seperately and not depending on each other. The two integrated top and bottom arms mechanism of the earth-anchor ensures good stability and resistance against lifting, pushing, and lateral forces.

The invention also provide the advantage that the arms, whether they are the top sets or the bottom sets, do not require the process and hassle of digging or major preparation in order to be driven out deep into the ground. Furthermore the earth-anchor now gives the possibility to make adjustments in various possible directions by regulating the adaptor to give easy access to accomodate end-products such as sheds, signs, road products. The level of precision and accuracy is highly rated and as good as the concrete-based foundations.

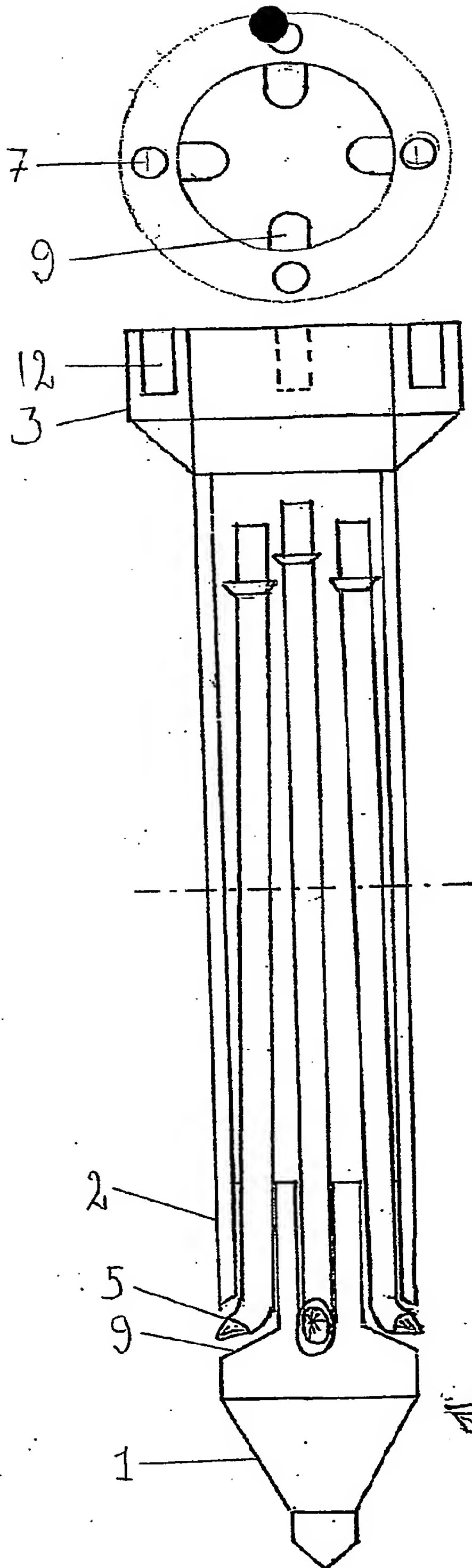


FIG. 1

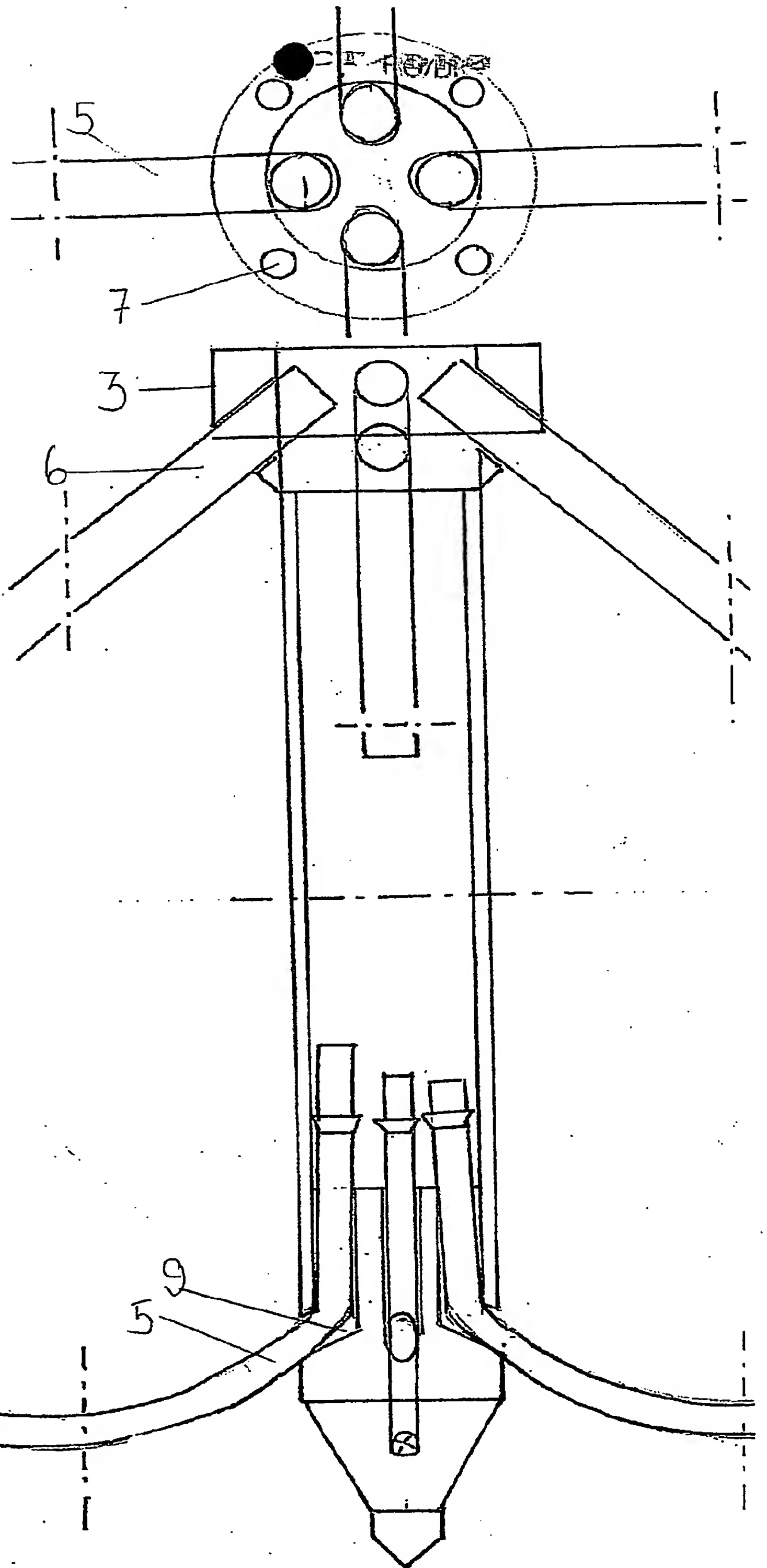


FIG. 2

FIG. 3

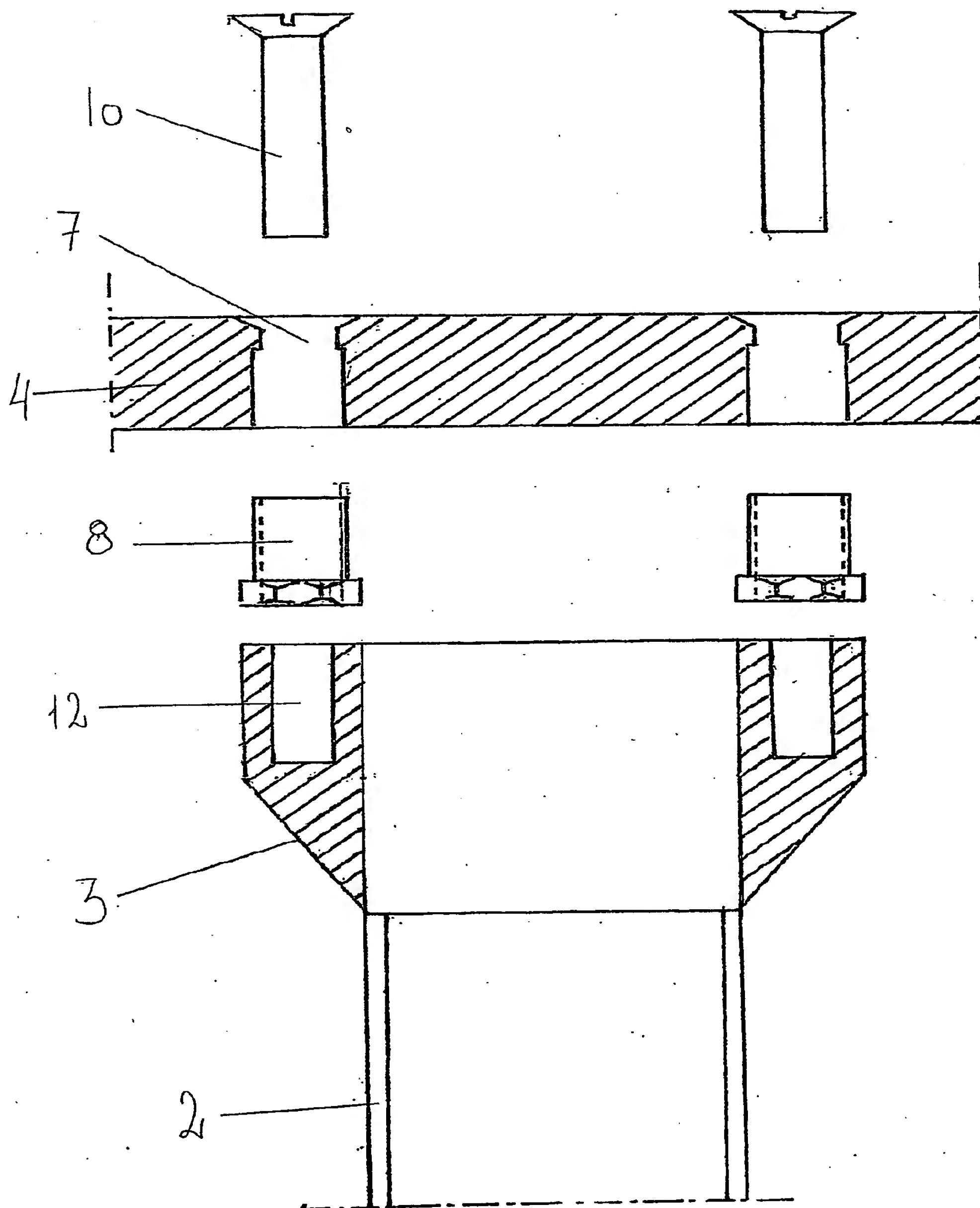


FIG 3a

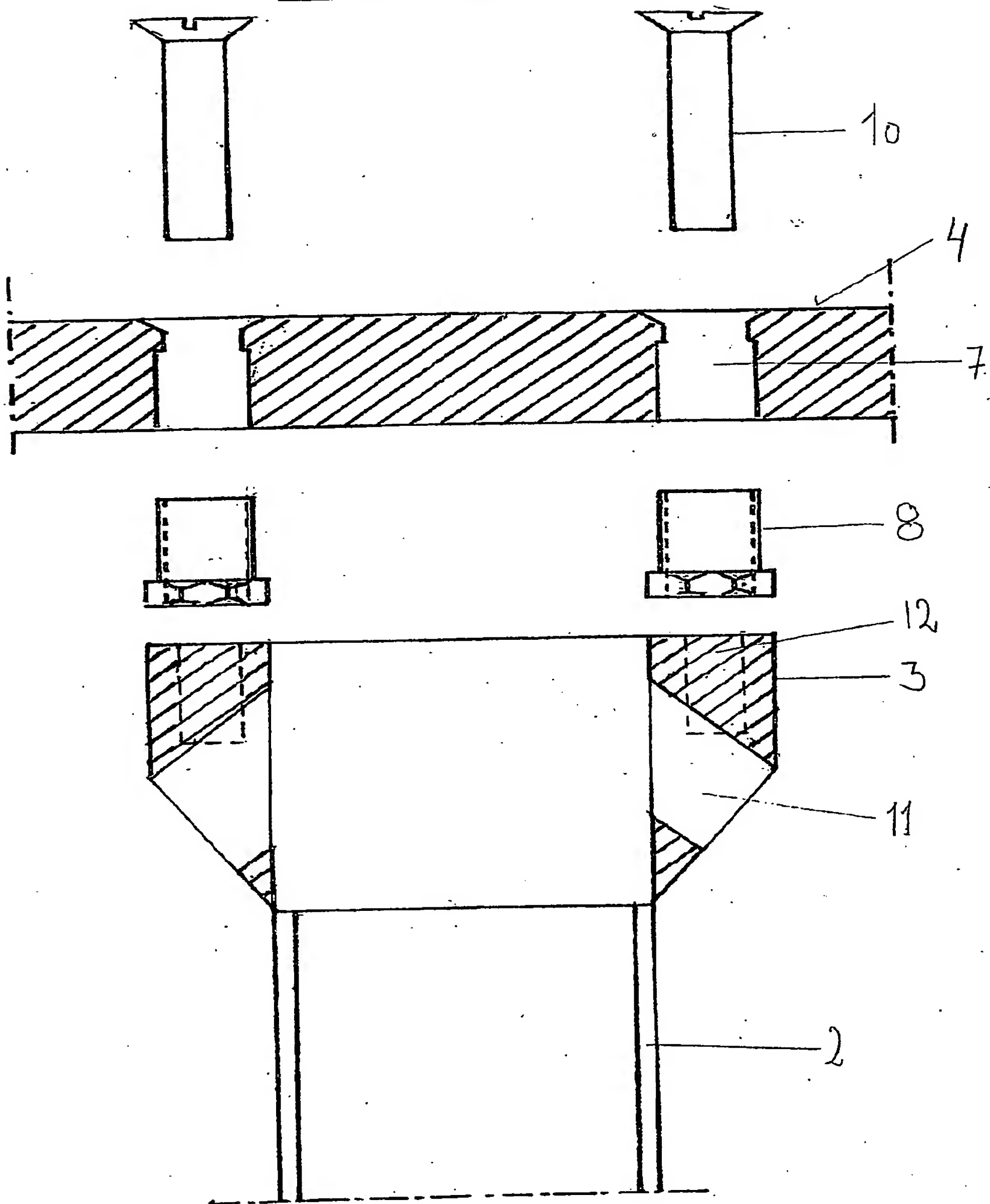


FIG. 4

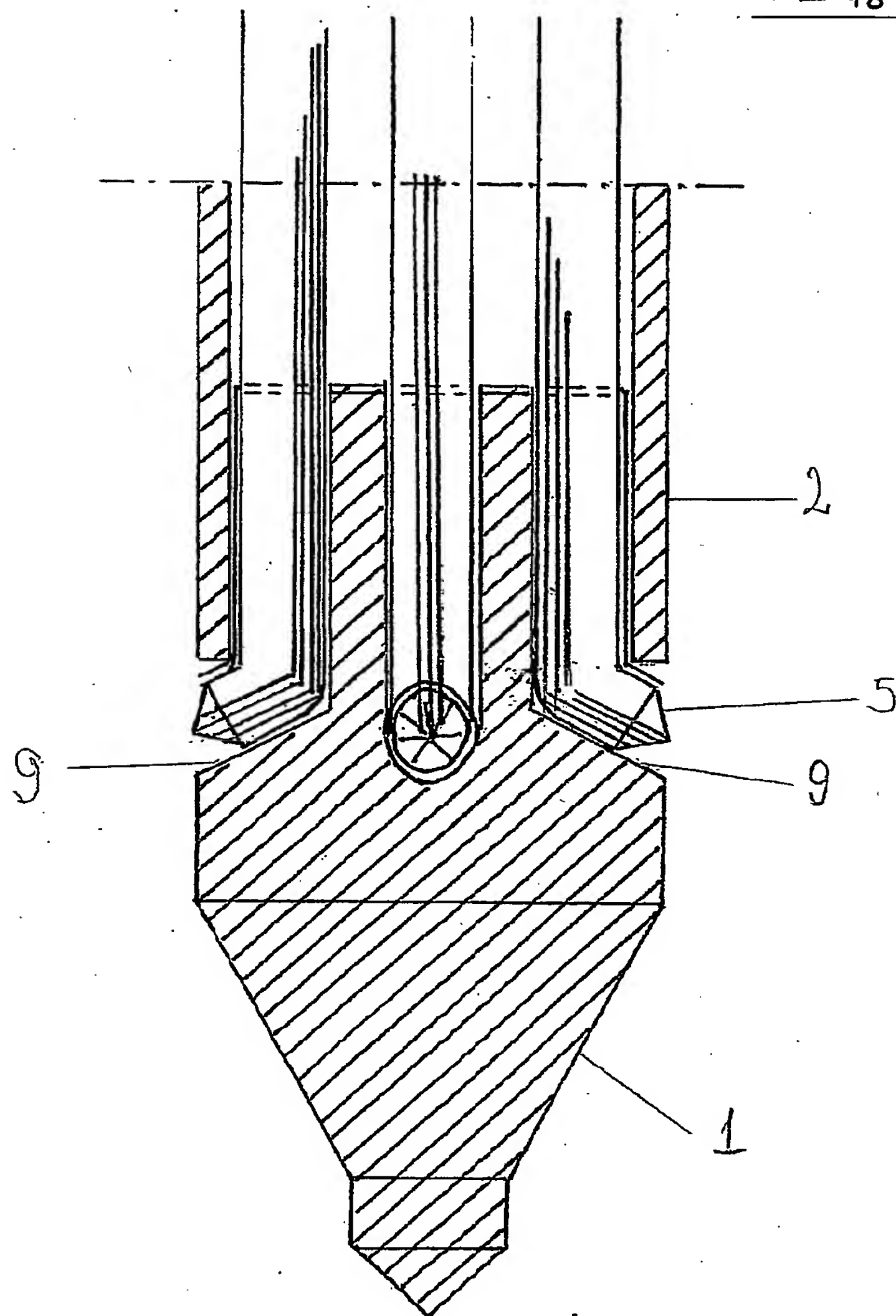
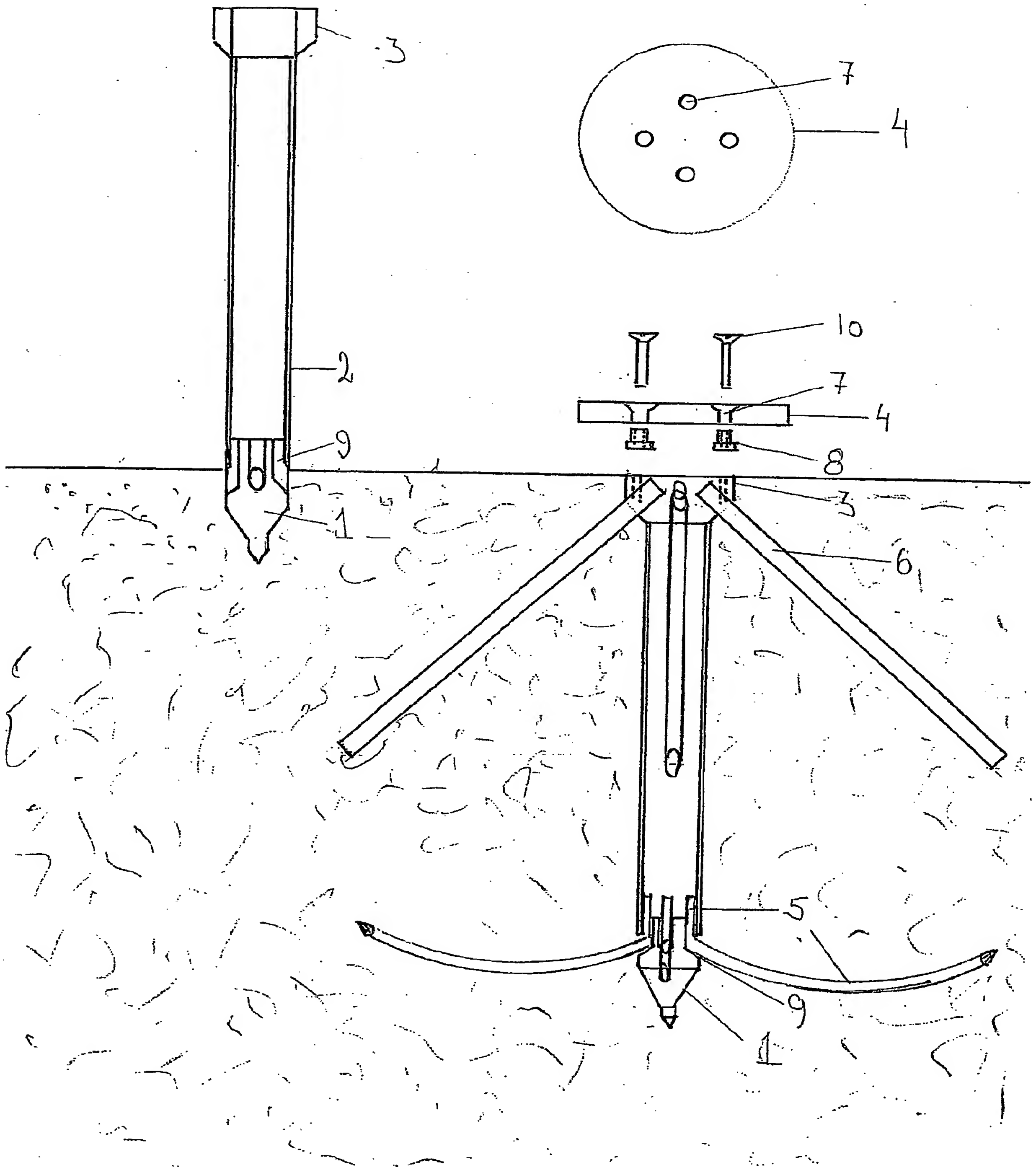


FIG. 5

FIG. 6



INTERNATIONAL SEARCH REPORT

International application No.

PCT/DK 03/00524

A. CLASSIFICATION OF SUBJECT MATTER

IPC7: E01F 9/018, E02D 5/54, E02D 5/74, E02D 5/80, E04H 12/22
According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)

IPC7: E02D, E01F, E04H

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

SE,DK,FI,NO classes as above

Electronic data base consulted during the international search (name of data base and, where practicable, search terms used)

EPO-INTERNAL, WPI DATA, PAJ

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	US 3676965 A (R.F. DEIKE), 18 July 1972 (18.07.72), column 2, line 50 - column 3, line 43, figures 1-10, abstract --	1-5
A	US 4603520 A (R.F. DEIKE), 5 August 1986 (05.08.86), column 1, line 32 - column 3, line 31, figures 1-5, abstract --	1-5
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☒ Further documents are listed in the continuation of Box C.☒ See patent family annex.

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Date of the actual completion of the international search

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INTERNATIONAL SEARCH REPORT

International application No.

PCT/DK 03/00524

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INTERNATIONAL SEARCH REPORT

Information on patent family members

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